Commercial Transportation Energy Conservation Awareness Survey

Alberta

ENERGY AND
NATURAL RESOURCES
Energy Conservation Branch

COMMERCIAL TRANSPORTATION
ENERGY CONSERVATION AWARENESS SURVEY

Prepared for

ALBERTA ENERGY AND NATURAL RESOURCES

ENERGY CONSERVATION BRANCH

by

John T. New
Transportation Consultant
Calgary, Alberta

June 1984
Edmonton

Alberta
ENERGY AND
NATURAL RESOURCES

ENR Dept. 73

Additional copies of this report may be obtained from:

Energy Conservation Branch
Alberta Energy and Natural Resources
2nd Floor, Highfield Place
10010 - 106 Street
Edmonton, Alberta
T5J 3L8

First Edition Published June 1984

Please Note

The views, conclusions and recommendations expressed in this study are those of the consultant and not necessarily those of the department.

Preface

The Energy Conservation Branch promotes improved energy efficiency through information and education programs. The Industrial Section operates an energy audit service for commercial and industrial buildings and processes. An extension of this service to the commercial transportation industry is being considered.

This survey was undertaken to identify the general level of awareness of the cost-saving advantages of improved fuel efficiency within the various commercial transportation subsectors in Alberta. This information will be useful in determining whether information and awareness programs directed at commercial transportation would improve fuel efficiency.

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY

TABLE ES-1 IMPLIED SAVINGS OPPORTUNITIES BY TARGET GROUP THROUGH ENERGY CONSERVATION AWARENESS

1.0 INTRODUCTION 1

1.1 Intent and Scope of the Survey 1
1.2 General Comments 2

2.0 SELECTION OF TARGET GROUPS AND SURVEY METHODOLOGY 4

2.1 Selection of Target Groups 4
2.2 The Calgary Pilot Group Survey 7
2.3 The Telephone Survey 8
2.4 General Parameters of the Survey 8

3.0 LEVELS OF AWARENESS, KNOWLEDGE AND ATTITUDES RESIDENT WITHIN EACH GROUP 10

3.1 Management Awareness 10
3.2 Fuel Cost Awareness 11
3.3 Technical Awareness 11
3.4 Program Awareness 12
3.5 Survey Results Summary - By Target Group 12

DETAILED SUMMARIES BY TARGET GROUP CATEGORY

GRAPHIC SUMMARIES OF AWARENESS BY TARGET GROUP Figs. 4-1 to 4-4

4.0 LEVELS OF ENERGY CONSERVATION BEING IMPLEMENTED WITHIN THE TARGET GROUPS 26

5.0 STATE-OF-ART TECHNOLOGY FOR POTENTIAL ENERGY SAVINGS 30

5.1 Light Vehicles 30
5.2 Medium Trucks 31
5.3 Light Heavy Trucks 31
5.4 Heavy Trucks 31
5.5 Fuel Consumption and Cost Comparison 33

TABLE 5-1 CONSUMPTION AND COST COMPARISON BY TRUCK SIZE AND FUEL TYPE

5.6 A Special Note on Fuels 35

TABLE OF CONTENTS - cont'd.

Page

6.0 OPPORTUNITIES FOR IMPROVING ENERGY CONSERVATION AWARENESS 37

6.1 Energy Conservation Branch 37
6.2 Joint Government and Industry Cooperation 40

TABLE 6-1 THE ROLE OF THE TRUCKING INDUSTRY, VEHICLE MANUFACTURERS AND GOVERNMENTS IN PROMOTING GREATER ENERGY AWARENESS

7.0 ADDITIONAL OPPORTUNITIES FOR EXPANDING ENERGY AWARENESS 42

7.1 With Transportation Service Users 42

TABLE 7-1 ANNUAL VOLUMES OF GOODS PER CAPITA MOVING WITHIN CANADIAN CITIES 43

TABLE 7-2 WEIGHT DISTRIBUTION OF SHIPMENTS 44

TABLE 7-3 POTENTIAL FUEL SAVING IN URBAN TRUCKING 45

8.0 AWARENESS SURVEY CONCLUSIONS 46

TABLE 8-1 TARGET AREAS FOR AWARENESS PROGRAMS

Appendix "A" - Survey Contact List (deleted by ENR)

Appendix "B" - Sample Survey Questionnaires

Appendix "C" - Explanation of the Scoring System: Limitations of the System

EXECUTIVE SUMMARY

Private trucks operating in urban areas display the weakest operating system management, the lowest general level of subscription to new technology and demonstrate the least concern for vehicle fuel costs of the eight target groups surveyed. This group represents the largest challenge for promoting awareness and the greatest opportunity for reducing fuel costs to benefit the majority of system users in Alberta.

The rankings for the eight target groups, in terms of implied savings by group, are as follows (from high to low opportunity):

1. Private Trucks - Urban Operations
2. School Buses
3. Messenger/Courier Service
4. Taxis
5. Utility and Service Vehicles
6. Private Trucks - Highway Operations
7. Heavy Trucks - Highway Operations (driver-owned)
8. Heavy Trucks - Highway Operations (company-owned)

Refer to Table ES-1

The commercial interests and operational environment for most of the groups is quite dissimilar; but the method in which each manages its equipment, human, and motive fuel resources has a direct bearing on profitability and commercial viability, particularly in today's struggling and highly competitive economy.

Programs aimed at improving fuel consumption and cost awareness must be directed at senior management. Where mandates for system improvement are generated in any vehicle fleet context, even if a fleet is comprised mainly of owner-drivers, the prerogative for cost efficiency and operational competency still resides with the management that underwrites the conditions of service.

This includes governing vehicle specifications, establishing operational criteria and setting quality of performance standards for drivers.

The driver training classroom must be considered an effective starting point for fuel cost awareness, as it currently is for safety. The learners of today are the drivers, mechanics, dispatchers and managers of the commercial vehicles of tommorow,as well as the service users.

Recommendations for disseminating awareness include:

- mounting a media and awareness literature campaign
- conducting awareness and state-of-art technology seminars
- directing awareness information to service users (eg. school districts)
- underwriting programs which get vehicle operators "involved"
- promoting awareness and fuel cost saving advantages to land use planners, architects, and other agencies involved in infrastructure development.

The greatest fuel savings opportunities for commercial vehicles are in urban areas where vehicles average speed is low, idling time is high and route circuity occurs. In Alberta cities there is significant scope for expanding the rate of conversion to alternate fuels which will serve a dual purpose of reducing costs while reducing environmentally harmful exhaust emissions.

TABLE ES-1

Implied Savings Opportunities by

Target Group Through Energy Conservation Awareness

User Category	Heavy Tr. Company	Heavy Tr. Drv.-owned	Private Hwy.	Private Urban	Utility/ Service	Mssgr./ Courier	Taxis	Buses
AWARENESS:								
Program Interest								
- Sr. Mgemnt.	High	High	Low	Low	High	Medium	Medium	Medium
- Operations	High	High	Medium	Low	Medium	Medium	Medium	Medium
- Drivers	High	Medium	Medium	Low	Medium	Low	Medium	Low
PROBABLE LEVEL OF SUBSCRIPTION TO AWARENESS PROGRAMS:								
- Sr. Mgemnt.	High	Medium	Low	Low	High	Low	Low	Medium
- Operations	High	Medium	Medium	Low	Medium	Low	Low	Medium
- Drivers	High	Medium	Medium	Low	Medium	Medium	Medium	Low
BENEFITS TO BE OBTAINED THROUGH SUBSCRIPTION TO AWARENESS PROGRAMS								
- Lower Fuel Costs	Low	Low	Medium	High	Medium	High	High	High
- Alternate Fuels	Low	Low	Low	High	High	High	High	High
- Higher Technlgy.	Low	Medium	Medium	High	Medium	High	Medium	High
- Improved Driver Skills	Medium	Medium	Medium	High	Medium	High	Medium	High
- Service User Savings	Medium	Medium	Medium	High	High	High	High	High
- Target Group Priority	8	7	6	1	5	3	4	2

1.0 INTRODUCTION

1.1 INTENT AND SCOPE OF THE SURVEY

The objective of this project, commissioned by the Energy Conservation Branch of Alberta Energy and Natural Resources, was to "survey the commercial transportation industry in Alberta, analyze the data and provide results that could be used to develop energy conservation awareness programs".

The survey encompassed the preparation of questionnaires which were utilized by the consultant during interviews with respondents in the for-hire, private and owner-operator sectors covering urban, inter-urban and inter-provincial highway transportation, and which included commercial vehicle users grouped into eight general operating categories, as follows:

1. Heavy trucks, company-owned
2. Heavy trucks, driver-owned
3. Private trucks, inter-city operations
4. Private trucks, urban operations
5. Utility and Service Vehicles
6. Messenger and Courier Services
7. Taxis
8. Buses

For each of the eight target groups the role and attitude of management in energy conservation was ascertained; subscription of vehicle user groups to available fuel saving technology was determined; plus opinions and views on how industry or government could enhance or improve fuel savings were obtained.

Survey data were then analyzed to provide an indication to the Energy Conservation Branch of how future awareness programs directed towards commercial vehicle users might best be structured and to highlight user groups from which the greatest measurable benefits of programs could be obtained.

1.2 GENERAL COMMENTS

The current level of energy and energy cost awareness prevailing among commercial vehicles users in Alberta today is moderately high. Economic buoyancy during the latter half of the 1970's and the early months of the 1980's created a high demand for goods and services resulting in a tremendous proliferation of the commercial motor vehicle fleet. The recession that followed, however, has created a competitive atmosphere forcing many vehicle operators to reassess the component expenses of their operations and, as a matter of survival, adopt stringent measures for reducing costs wherever possible.

In the "for hire" vehicle sector there have always been "prudent" operators; those that have stayed abreast of cost-effective technical and operating system advancements and innovations. These operators are the ones best geared for survival and most likely to show favourable operating ratios at the end of their fiscal years. For "private" vehicle operators, the cost of transportation is often lumped into a general category of overhead costs where the component expenses of vehicle ownership and operations are obscured by more significant corporate priorities; sales of merchandise and higher levels of customer service.

Regardless of the best efforts of commercial vehicle operators in Alberta to reduce fuel consumption and costs, the question of technical competency in the manufacturing industry to produce more energy efficient vehicles is raised. A gallon of gasoline or diesel fuel contains a specific amount of energy. The energy input required to overcome the inertia of vehicle weight should be more or less proportional to the weight; however, this has not been demonstrated in the use and application of commercial motor vehicles. For example:

- school buses, largely gasoline-powered, average 45 - 55 litres per 100 km while heavier diesel-powered freight trucks may consume only 22 - 28 litres per 100 km;

- intercity diesel buses weighing under 20,000 kg consume fuel at a rate almost equivalent to the freight-carrying semi-trailer weighing 38,000 kg;

- gas-powered pickup trucks weighing 2,000 kg may average 17 - 20 litres per 100 km on highway operations while passenger cars at 1,500 kg travel may burn only 9 - 10 litres over the same distance.

An exception to these general variations in fuel consumption between vehicle tvpes occurs in many heavy vehicle categories. The diesel tractor of today with a high torque rise engine of 350 to 400 horsepower is capable of producing better fuel economy at 38,000 kg of gross vehicle weight than its predecessor 190 to 220 hp engine of 20 years ago at 32,000 kg.

The finite measure of commercial vehicle fuel economy is not miles per gallon or litres per 100 km but the number of ton-miles or passenger kilometres which can be generated from a gallon or litre of gasoline, diesel fuel, propane or natural gas.

However, even tonne-km/litre do not fully measure fuel efficiency as energy efficiency is commodity-specific. For example, the movement of fresh-cut flowers cannot be compared to dressed meat in terms of energy efficiency.

Many vehicle users are not conditioned or educated to think in these terms, or to use them as prime motivations for increasing energy efficiency and reducing costs.

2.0 SELECTION OF TARGET GROUPS AND SURVEY METHODOLOGY

2.1 SELECTION OF TARGET GROUPS

For survey purposes, commercial vehicles were divided into eight broad usage and/or ownership categories. These are outlined briefly as follows:

2.1.1 Heavy Trucks, Company -owned and Operated

This use category encompasses primarily diesel tractors and trailer combinations totalling 5-9 axles (up to 53,500 kg GVW) which transport bulk commodities under long term contract, which transport truckload freight on a trip-charter basis and which carry LTL[1] freight on regular or irregular route service, both intra and interprovincially. Specialized heavy haulage is included. Power units and trailers and terminals are company-owned. Lease operators are used mainly during peak annual traffic period demands but rarely constitute more than 25 percent of the operating fleet.

2.1.2 Heavy Trucks - Principally Driver Owned and Operated

This category of vehicles includes diesel tractors and trailer combinations totalling 5-8 axles and up to 53,500 kg GVW. The company acts principally as a freight broker for contract, charter, or scheduled LTL freight service, owning from zero to perhaps 50 percent of the power units, most of the trailers (particularly if specialized bulk freight hauling is involved), terminal facilities and operating authorities. The majority of power units employed belong to owner-operators who contract their services to the company for remuneration based upon distance-related income or a percentage of trip revenue.

[1] LTL - Less than Truckload Lots: A delivery combining multiple shipments

2.1.3 Private Trucking - Intercity

These are primarily company-owned heavy trucks which distribute the owners' products from point of primary manufacture or distribution direct to customers or to satellite distribution outlets. Depending on seasonal and volume fluctuations, lease operators may be employed but the transportation activity does not include operating on a for-hire revenue basis.

2.1.4 Private Trucking - Urban

These are light-to-heavy vehicles which operate primarily in an urban environment for distributing owners' goods. This category included, for survey purposes, trucks which haul under private or public contracts for urban waste removal, gravel hauling, etc., in addition to goods owners' vehicles.

2.1.5 Utility and Service Vehicle Fleets

This category include mainly vehicles which are involved in installation and mainenance of utilities - gas, electricity, telephone - or which are used to service major industries or projects.

Utility vehicles are used primarily for transporting technicians or supervisory personnel and to carry equipment or spare parts related to the service function. The majority are in the half to one ton pickup truck or van category. A small percentage are in the medium to heavy truck size.

2.1.6 Messenger and Courier Services

These vehicles are an extension of major international or interprovincial courier systems which provide highly time-sensitive services for commercial documents and small, high value items. Also included are the intra urban messenger services which pick up and deliver parcels and time-sensitive commercial documents throughout the urban network. Messenger vehicles include mainly sub-compact cars. Courier vehicles range from cars to pickup trucks, and vans with a small percentage of medium trucks.

2. .7 Taxis

Taxis provide urban passenger transport on a demand basis. Many taxi companies are associated with, or are used for messenger service.

2. .8 Buses

This category is restricted mainly to school bus operators, most of which also engage in group charters. Invalid, or disabled adult transportation services are included in this category. Vehicle sizes range from 7-passenger vans to 47-passenger charter buses and 80-passenger school buses.

2. 2 THE CALGARY PILOT GROUP SURVEY

Detailed questionnaires were prepared by the consultant for a pilot group survey to be conducted in the Calgary area. Two questionnaire formats were prepared; one for heavy trucks (generally 3-axle or larger trucks), and one for light trucks (all 2-axle size categories). A broad awareness question format was used for all vehicle user categories to facilitate later comparison between the categories - heavy and light trucks, for hire versus private trucks, company-owned versus owner-operated vehicles.

For approximately 50 percent of the company surveys conducted, appointments were made by phone prior to interviews to reach as close to the top level of management as possible. The time involved in prearranging interviews curtailed the amount of actual interview time available within the proposed survey work schedule. The other 50 percent of interviews were conducted on an extemporaneous call basis which provided access to a broader spectrum of corporate hierarchy from senior management to controller, maintenance superintendent, down to the dispatcher and driver level.

During interviews, respondents were encouraged to input beyond the questionnaire level in terms of technical lore and opinion related to vehicle fuel efficiency, operating skills and awareness attitudes. The majority of interviewees responded quite openly and candidly, providing greater substance and depth to the survey than might have otherwise occurred had only the prepared questions been answered.

Many of the extemporaneous responses have been paraphrased in descriptions of activities and approaches to energy cost awareness for various vehicle user categories outlined in subsequent sections of this survey.

In addition to interviews conducted among the various vehicle user categories, meetings in Calgary were also held with the Alberta Trucking Association, truck dealers, and representatives of propane and natural gas sales companies.

2.3 THE TELEPHONE SURVEY

Following the Pilot Group Survey, a brief summary was prepared by the consultant and the preliminary results were discussed with a representative of the Energy Conservation Branch. Questionnaires were then revised and shortened for an intensive four day telephone interview schedule covering other major centres of population in Alberta; Edmonton, Red Deer, Lethbridge, Medicine Hat, Fort McMurray, Grande Prairie and Lloydminster. Carriers or vehicle fleet operators in Drumheller, Rocky Mountain House and Whitecourt were also contacted.

Telephone interviews were conducted from a government office in Calgary using the Rite-Line System. Extensive delays in reaching community Rite-Line operators, amounting to approximately 25 percent of allocated telephone interview time, were encountered during the four days reducing the number of total contacts intended to be included in the survey.

2.4 GENERAL PARAMETERS OF THE SURVEY

The survey encompassed a total of 82 direct and telephone interviews covering a broad spectrum of vehicle users and transportation equipment applications. Sample questionnaires and detailed contact lists are included in Appendices "A" and "B" to this report.

The questions posed to interview respondents were mainly general knowledge and attitude-based and did not dwell heavily on company, equipment or operating system specifics. For many companies, data concerning fuel costs, vehicle consumption and cost consumption improvement factors are buried in accounting and statistical summaries which were not readily available; they are often located at corporate head offices in other parts of Canada or the U.S. Moreover, each company maintains statistics according to its individual needs and level of data processing sophistication employed. If an Alberta-based branch manager indicated during an interview that his company had

specific energy policies and objectives, but could not elaborate on his own responsibilities with regard to policies or objectives, it became apparent that the level of corporate awareness was ill-defined at lower echelon management, maintenance, or driver levels.

A five-tiered grading point system was used to indicate levels of awareness demonstrated by respondents during the interviews. Grades were assigned, in private, as soon after interviews as possible. These were based on a combination of the answer provided, the subject matter (knowledge) plus the attitude demonstrated toward the subject matter. Refer to Appendix "C" for an explanation of the grading system.

For the most part, attempts were made to conduct interviews with Alberta-domiciled companies; those most likely to be responsive to future energy awareness programs implemented in Alberta.

3.0 LEVELS OF AWARENESS, KNOWLEDGE AND ATTITUDES RESIDENT WITHIN EACH GROUP (SUMMARY OF SURVEY RESULTS)

3.1 MANAGEMENT AWARENESS

Depending upon the nature of the transportation activity, "management" may be vested at various levels of vehicle operating or ownership hierarchy:

- in the company-owned vehicle for-hire sector, awareness and knowledge are closely allied with operating ratios (costs divided by revenues) to which senior management are keenly cognizant - often on a daily basis

- for driver-owned vehicles (lease operators, taxis, courier/ messenger services) awareness is usually divided between the commercial or competitive aspects of the business manager/ licencee and the drivers who purchase fuel and operate the vehicles

- in private trucking, energy awareness and its manifestations often reside at the middle management level; distribution coordinators, traffic managers, industrial safety, and personnel managers or maintenance managers are often responsible for vehicle operations and costs within general administration and overhead cost parameters tied to the overall costs of running the organization - eg. raw material, manufacturing, packaging and marketing expense. (utility and service vehicles fall into this category).

There are also incentive factors which enter into management awareness for vehicle operations. In long distance highway operations, drivers are usually paid by distance or a percentage of trip revenue which can work for or against fuel economy, depending upon how driver activities are mandated.

In urban operations, drivers (excluding driver owners) are paid hourly or monthly salaries which is a lesser incentive to operate vehicles efficiently than in cases where driver performance, mechanical fitness or revenue directly impact on driver's earnings.

3.2 FUEL COST AWARENESS

Fuel cost awareness is based on four principal survey respondent inputs:

- the average reduction in fuel consumption for each vehicle user group over the past five years
- the opinion of user groups concerning the potential for achieving significant fuel savings (cost and/or volume) in the future
- the level of priority vehicle user groups attach to fuel consumption and costs (as a measure of overall cost or corporate priorities)
- alternate fuels: the level of cost savings awareness that exists and the current or proposed level of subscription to propane or natural gas that is occurring among the various user categories (heavy diesel truck categories were exempted from alternate fuel awareness).

3.3 TECHNICAL AWARENESS

Each respondent was graded on his perceived level of technical awareness in terms of:

- general state-of-art technology awareness toward the size and type of vehicle employed within the specific user category
- the standard of, or increased intensity that has occurred, in maintenance programs and systems with regard to improving fuel efficiency
- the level of subscription to available new vehicle technology that is taking place, by user groups, in current or proposed vehicle purchasing programs.

3.4 PROGRAM AWARENESS

Program awareness was measured in four separate categories:

- vehicle users' real or perceived need for more effective driver education and training
- vehicle users' recognition of speed as a highly sensitive fuel consumption factor (does not apply to urban vehicles restricted to lower speed limits)
- engine idling: a matter of concern to all vehicle owners. Engine shut down policies are implementable in most highway operation categories. In urban operations, however, many types of trucks (eg. transit mixers, garbage trucks, crane trucks) rely on power takeoff systems. In cold weather, most drivers rely entirely on truck cab heat (service vehicles, police cars, etc.) Awareness factors and responses were too indefinite to provide a grade point for most urban vehicles in this category
- fuel auditing: the intensity by which fuel consumption for each vehicle in a fleet is recorded and monitored as a guide to both driver proficiency and mechanical fitness.

3.5 SURVEY RESULTS SUMMARY - BY TARGET GROUP

The number of respondents for each Target Group category are shown as follows:

Category: 1.	For-Hire Heavy Trucks - Company-Owned	18
2.	For-Hire Heavy Trucks - Lease Operator	8
3.	Private Trucking - Intercity	7
4.	Private Trucking - Urban	11
5.	Utility and Service Vehicle Fleets	8
6.	Messenger and Courier Services	8
7.	Taxis	6
8.	Buses	8
	TOTAL	74

In addition, a total of eight interviews were conducted with truck and equipment dealers, representatives of propane and natural gas sales companies, and transportation associations. A detailed contact list is provided in Appendix "A".

Appenix "B" contains sample questionnaires used by the consultant during interviews.

A description of the point scoring system method used and an outline of limitations involved in the methodology is provided in Appendix "C".

Tables 3-1 through 3-8 and Figures 3-1 to 3-4, summarizing the results of the survey are included in the pages following.

Table 3-1

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 1. Company-Owned Fleet

NATURE OF ACTIVITY: For hire, Common/Contract or Charter Services-provincial/interprovincial

TRANSPORT CHARACTERISTICS: Bulk commodities, LTL freight, white goods, special hauling

VEHICLE OWNERSHIP: Power units, trailers, facilities company-owned; uses driver-owners during peak activities.

VEHICLE TYPE/SIZE: Highway: Diesel tractors, wide range of trailer configurations and combinations. Urban: Diesel, gas, propane P & D trucks and tractors (LTL)

MANAGEMENT AWARENESS

...Senior Management: Ownership and management responsibilities tied together. Significant capital investment and risk. Motivated to highest levels of cost and operating efficiency. Technically competent.

Point score 88.9

...Operations Management: Keenly aware of management objectives. Technically competent. Motivated to implement management mandates, innovation, systems improvement.

Point score 76.7

...Drivers: Good flow of dialogue with operations and Sr. Management. Motivated to higher standards of professionalsim. Obeys company rules/directives.

Point score 74.4

FUEL COST AWARENESS

Intensive audit and monitoring. Average recorded improvement (16.6%) over past five years through speed control, reduced idling, driver education, vehicle maintenance and subscription to new technology. Point score 55.1

TECHNICAL AWARENESS

Keeps abreast of technology; often compels vehicle and trailer to manufacturers to adopt better techniques (lighter alloys, etc.). Subscribes to sophisticated maintenance and fault diagnosis programs. Point score 62.4

FUEL SAVINGS PROGRAM AWARENESS

Constantly strives to improve driver professionalsim through educational seminars. Has implemented and enforced policies governing speed of vehicles, engine idling. Subscribes to appropriate streamlining; employs vehicles best suited to the transport activity. Point Score 73.6

TOTAL POINT SCORE 431.1

Table 3-2

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 2. Lease Operator Fleet

NATURE OF ACTIVITY: For hire, common/contract or charter services-provincial/interprovincial.

TRANSPORT CHARACTERISTICS: Bulk commodities, LTL freight, white goods, special heavy hauling.

VEHICLE OWNERSHIP: Some power units, most trailers company-owned; high proportion of driver-owners.

VEHICLE TYPE/SIZE: Highway: Diesel tractors, wide range of trailer configurations and combinations.
Urban: P & D vehicles (mainly company-owned and operated).

MANAGEMENT AWARENESS

...Senior Management: Less ownership risk than company-owned fleet. Relies more heavily on efficiency of driver-owners. Technically and operationally competent, lower management control mandate than company fleet category.

Point score 72.5

...Operations Management: Service oriented, less concern for technical aspects of vehicle ownership. High degree of spot market brokerage, lower intensity in overall transport system efficiency.

Point score 52.5

...Drivers: Motivated to reduce gap between fuel costs and trip or distance revenue. Level of performance rather than quality major consideration. Lower control mandate from Sr. management.

Point score 47.5

FUEL COST AWARENESS

High for driver-owners; a lower company priority. Average recorded improvement over past five years-9.7%-mainly through improved vehicle technology.

Point score 49.9

TECHNICAL AWARENESS

Relies on example of company-owner fleets for improved technology. Vehicle "image" a significant factor in selection and purchase; Likely to defer maintenance. Level of awareness varies from driver to driver.

Point score 59.2

FUEL SAVINGS PROGRAM AWARENESS

High degree of self-education and discipline. Lower access to state-of-art technology information but often high innovation as individuals. Less conscious of speed/fuel consumption relationship.

Point Score 71.9

TOTAL POINT SCORE 353.5

Table 3-3

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 3.

NATURE OF ACTIVITY: Private trucking - provincial/interprovincial.

TRANSPORT CHARACTERISTICS: Bulk raw materials, manufactured goods.

VEHICLE OWNERSHIP: Vehicles owned by owner of the cargo.

VEHICLE TYPE/SIZE: Wide range of vehicles specially adapted for the cargo.

MANAGEMENT AWARENESS

...Senior Management: Profit motives dictated by commodity sales and customer service. More distribution management than transport management oriented. Relies on lower management level for system efficiencies.

Point score 45.7

...Operations Management: Efficiency may be constrained by other management priority objectives. Less likely to have "association" exposure or access to state-of-art technology information but often higher awareness than senior management.

Point score 54.3

...Drivers: High company image consciousness. Often long-term salaried or hourly-rated employees. Complies with company directives. Exercises caution and awareness.

Point score 54.3

FUEL COST AWARENESS

Fuel costs tend to be buried in general operating and statistical accounts. Average recorded improvement over past five years 6.4%. Fuel consumption/cost generally not a high corporate priority.

Point score 41.2

TECHNICAL AWARENESS

Tend to trade in on technical improvements achieved by the for-hire sector. Greater tendency to over or underpowering than selection of appropriate equipment. Low subscription to trade journals and technical information.

Point score 42.0

FUEL SAVINGS PROGRAM AWARENESS

Driver education, speed, maintenance, vehicle idling and intensive fuel auditing are a lower priority than for-hire carriers. Cost of truck operation falls more into the general category of corporate overheads.

Point Score 38.5

TOTAL POINT SCORE 276.0

Table 3-4

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 4.

NATURE OF ACTIVITY: Private trucking. Urban commodity distribution.

TRANSPORT CHARACTERISTICS: Wide range of products: food, building materials, white goods.

VEHICLE OWNERSHIP: Vehicles owned by owner of the cargo.

VEHICLE TYPE/SIZE: From pickup truck to large combination units.

MANAGEMENT AWARENESS

...Senior Management: Motivated by commodity sales and customer service. Low technical competency. Relies on lower management or drivers to obtain system efficiencies. Low involvement in transport operations.

Point score 40.0

...Operations Management: Trucking may fall under the jurisdiction of a safety or personnel administrator, a plant operations manager, an accountant, or a dispatcher. Little consolidation of fuel efficiency awareness.

Point score 38.2

...Drivers: Prime responsibility lies in meeting delivery schedules; not efficient vehicle operation. Often high driver turnover rate affecting operational cost efficiency. Generally no formal driver education.

Point score 38.2

FUEL COST AWARENESS

Average fuel consumption improvement. Past five years 8.7% - mainly through conversion to alternate fuels; not operating systems improvement.

Point score 35.6

TECHNICAL AWARENESS

Vehicles often oversized and under utilized. Little awareness of fuel savings options currently available. Tends to blame vehicle manufacturers for poor consumption.

Point score 43.6

FUEL SAVINGS PROGRAM AWARENESS

Subscribes to few improvement programs for drivers or vehicles. Does little to educate drivers or monitor driver activities. Maintenance and fuel auditing generally low priority.

Point Score 33.2

TOTAL POINT SCORE 228.8

Table 3-5

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 5.

NATURE OF ACTIVITY: Utility and Service vehicles.

TRANSPORT CHARACTERISTICS: Tools, spare parts and equipment related to the service function.

VEHICLE OWNERSHIP: Utility companies, municipalities, large industrials, resource companies.

VEHICLE TYPE/SIZE: Autos, pickup trucks, vans, fire engines, ambulances, some heavy trucks.

MANAGEMENT AWARENESS

...Senior Management: Vehicles high necessary to, and a high cost component of the service function. Cost and operations a significant senior management priority. Generally forced to operate efficiently within stringent budget guidelines.

Point score 75.0

...Operations Management: Many vehicles in category operate on an "essential service" basis. Vehicle selection and turnover rate is highly governed by usage factor. Roving supervisors monitor vehicle activities.

Point score 57.5

...Drivers: Large proportion of technicians and supervisory staff are assigned to vehicles. Generally operate vehicles according to clearly defined senior management policies.

Point score 52.5

FUEL COST AWARENESS

Intensive fuel auditing, increasingly growing subscription to alternate fuels-propane, natural gas. Consumption improvement past five years 6.8% through downsizing vehicles and engines.

Point score 44.8

TECHNICAL AWARENESS

Generally have person or persons continually involved in vehicle and operational cost research. Subscribe to usage-related maintenance and sophisticated fault diagnosis systems.

Point score 70.0

FUEL SAVINGS PROGRAM AWARENESS

Strive to match vehicle to activity. Receptive to considerable investigation/experimentation with alternate fuels currently underway. Vehicles/drivers operate from satellites to reduce fuel and time costs.

Point Score 70.8

TOTAL POINT SCORE 370.6

Table 3-6

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 6.
NATURE OF ACTIVITY: Messenger/courier services (mainly urban)

TRANSPORT CHARACTERISTICS: Generally high value or time sensitive commercial documents & small parcels.

VEHICLE OWNERSHIP: Some company fleets, recent heavy trend to driver-owners.

VEHICLE TYPE/SIZE: Sub compact cars, pickup trucks, vans, mainly light vehicles.

MANAGEMENT AWARENESS

...Senior Management: Awareness is high for fleet-owned vehicles; substantial but complacent when driver-owners are employed. Low awareness motivation.

Point score 52.5

...Operations Management: Much the same attitude as senior management. Major thrust of activity is customer service with little concern for energy cost awareness.

Point score 47.5

...Drivers: Most are highly aware of fuel cost but do not earn enough to provide the most appropriate vehicle or afford conversion to alternate fuels.

Point score 40.0

FUEL COST AWARENESS

Reported improvement in fuel consumption, zero. In messenger category, most mid to full size cars have disappeared because of low earnings potential.

Point score 29.2

TECHNICAL AWARENESS

Some large fleet companies have worked closely with manufacturers for many years to produce a fuel efficient urban courier vehicle. Driver-owners much less aware in vehicle selection.

Point score 41.7

FUEL SAVINGS PROGRAM AWARENESS

Most operators aware of alternate fuel cost benefits. Few can afford cost of conversion in current economic climate. Majority of operators have curtailed engine idling.

Point Score 40.8

TOTAL POINT SCORE 251.7

Table 3-7

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 7.

NATURE OF ACTIVITY: Taxi

TRANSPORT CHARACTERISTICS: Passengers/some courier services.

VEHICLE OWNERSHIP: Heavy recent decline in fleet ownership in Calgary and Edmonton.

VEHICLE TYPE/SIZE: Mid to full size American sedans in Calgary/Edmonton; some compacts in smaller cities.

MANAGEMENT AWARENESS

...Senior Management: Significant awareness but all concern is directed towards increasing commissions and fuel sales to operators. Size of vehicles in Calgary/Edmonton controlled by Taxi Commission.

Point score 46.7

...Operations Management:

Medium awareness but little concern and no mandate for improvements.

Point score 46.6

...Drivers: High concern for fuel cost but little general fuel savings technology demonstrated in choice or selection of vehicles. Special "taxis" are available from manufacturers; few are ever purchased.

Point score 46.7

FUEL COST AWARENESS

The average fuel consumption savings during past five years (excluding conversions to propane) is less than 5%.

Point score 35.0

TECHNICAL AWARENESS

Most taxis are ex-company lease or retired "U-drive" units. Little technical awareness is involved. Usually only demand maintenance is practiced.

Point score 46.7

FUEL SAVINGS PROGRAM AWARENESS

Consolidated programs do not exist. Higher rate of conversion to propane in Calgary/Edmonton than smaller cities. Little dialogue occurs between companies in current competitive climate.

Point Score 62.1

TOTAL POINT SCORE 283.8

Table 3-8

ENERGY CONSERVATION AWARENESS SUMMARY

CATEGORY 8.

NATURE OF ACTIVITY: School and Charter Bus Services/Disabled Adult Transportation

TRANSPORT CHARACTERISTICS: Students, senior citizens groups

VEHICLE OWNERSHIP: Mainly company fleets; small contractors in rural areas

VEHICLE TYPE/SIZE: 7 passenger van to 80 passenger school buses, specialized units for disabled

---

MANAGEMENT AWARENESS

...Senior Management: Very high in some companies; low in others. Many buses operate on subsidies which affect the awareness level that might otherwise prevail.

Point score 50.0

...Operations Management: Mechanical condition of buses and safety take precedence over other awareness factors. Utilization of equipment is generally low due to seasonal demand.

Point score 45.0

...Drivers: Many drivers employed on a part-time morning-afternoon basis. Must satisfy minimum proficiency standards but driving skill levels (related to vehicle size) considered to be low, according to several owners.

Point score 37.5

FUEL COST AWARENESS

One company reported 5 year consumption savings of 14%. Others reported negligible improvement (excluding conversion to propane). Many owners blame manufacturers for poor consumption.

Point score 43.3

TECHNICAL AWARENESS

Many owners not aware of conversion cost benefits or unwilling to experiment. Some owners feel drive-train technology lags behind other categories of vehicles.

Point score 37.5

FUEL SAVINGS PROGRAM AWARENESS

Fuel auditing systems are poor. Driver education/proficiency standards are low and subscription to alternate fuels is slow. Many operators seem complacent about fuel savings.

Point Score 46.9

TOTAL POINT SCORE 260.2

FIGURE 4-1

MANAGEMENT AWARENESS

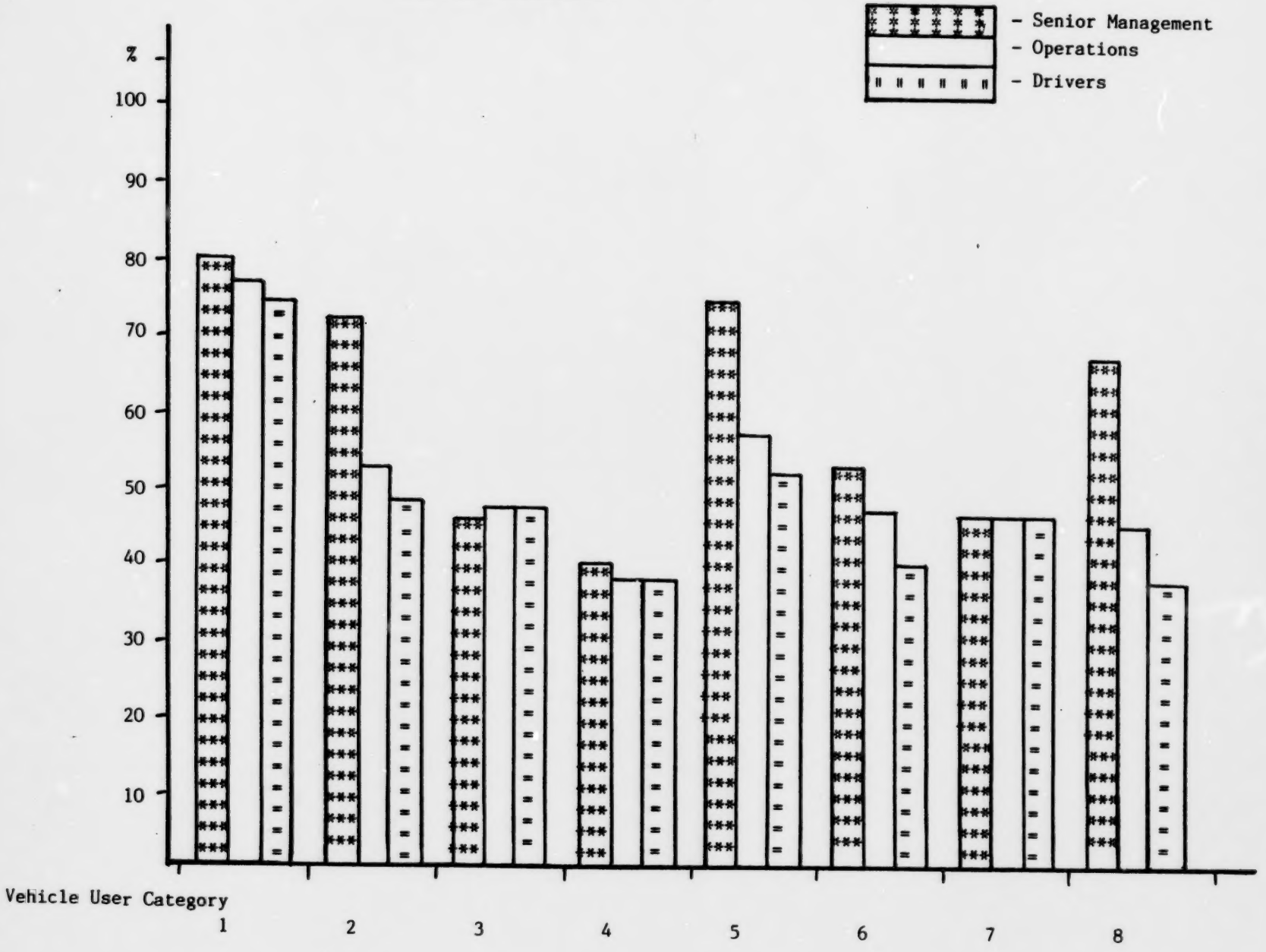


FIGURE 4-2

FUEL COST AWARENESS

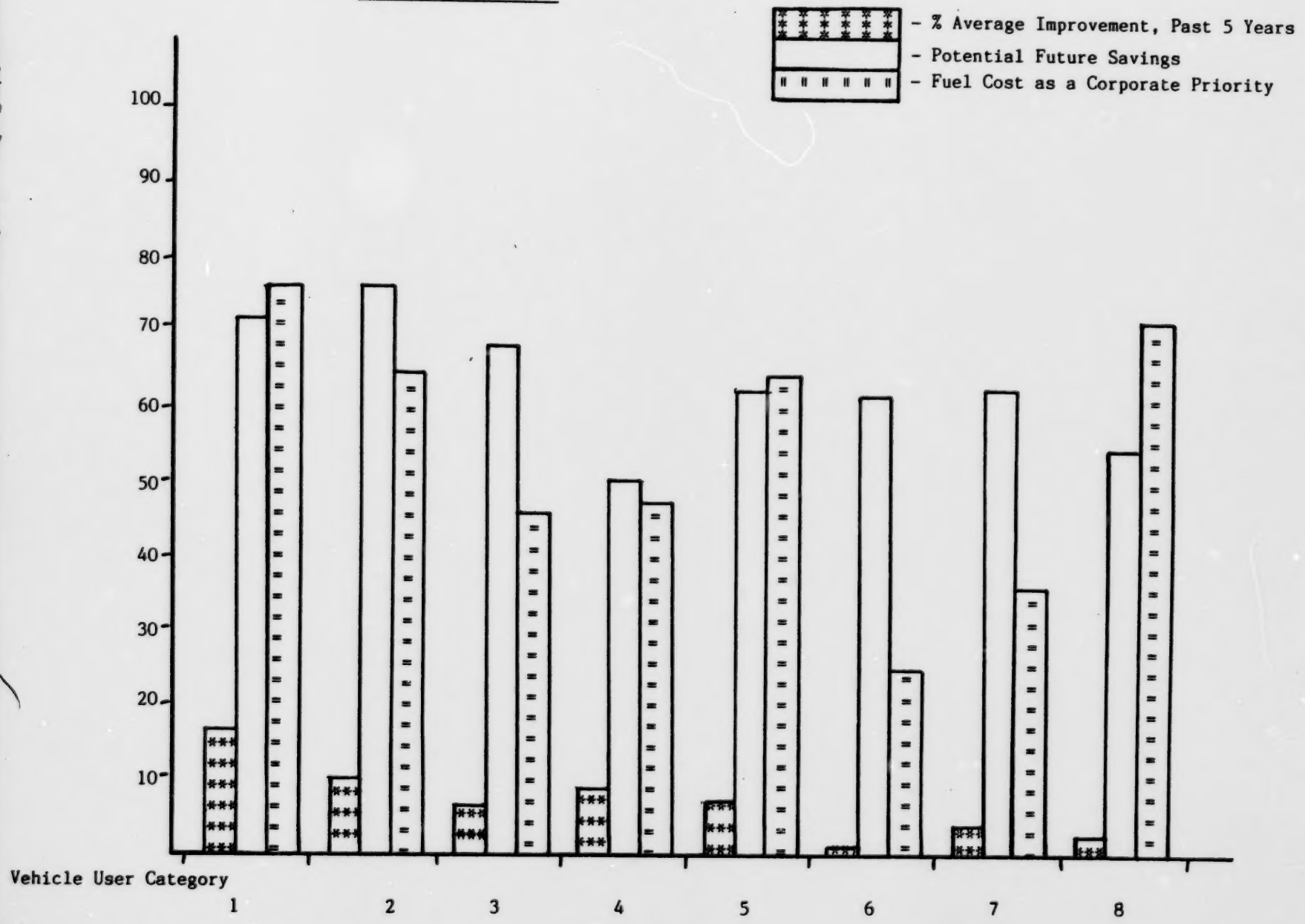


FIGURE 4-3

TECHNICAL AWARENESS

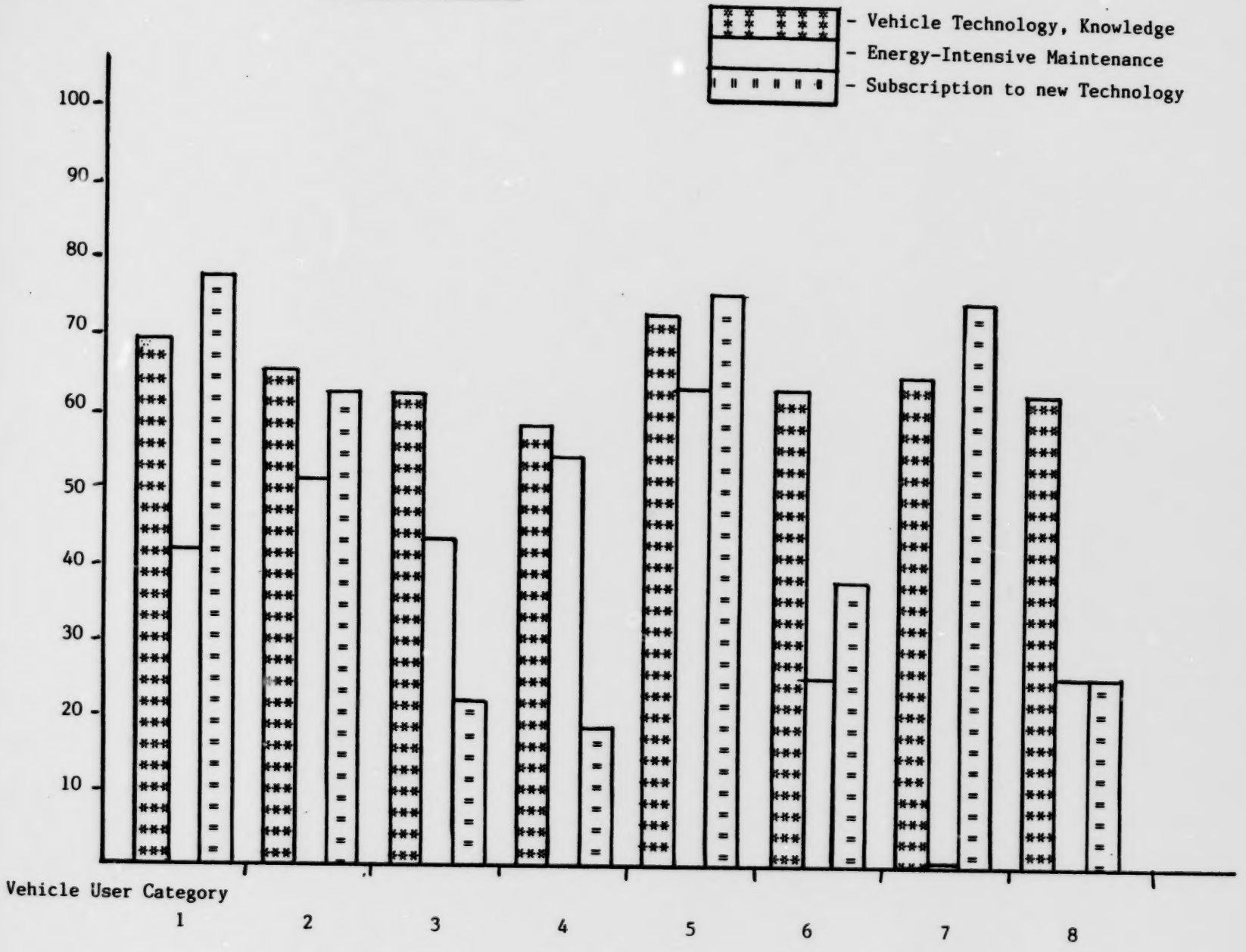
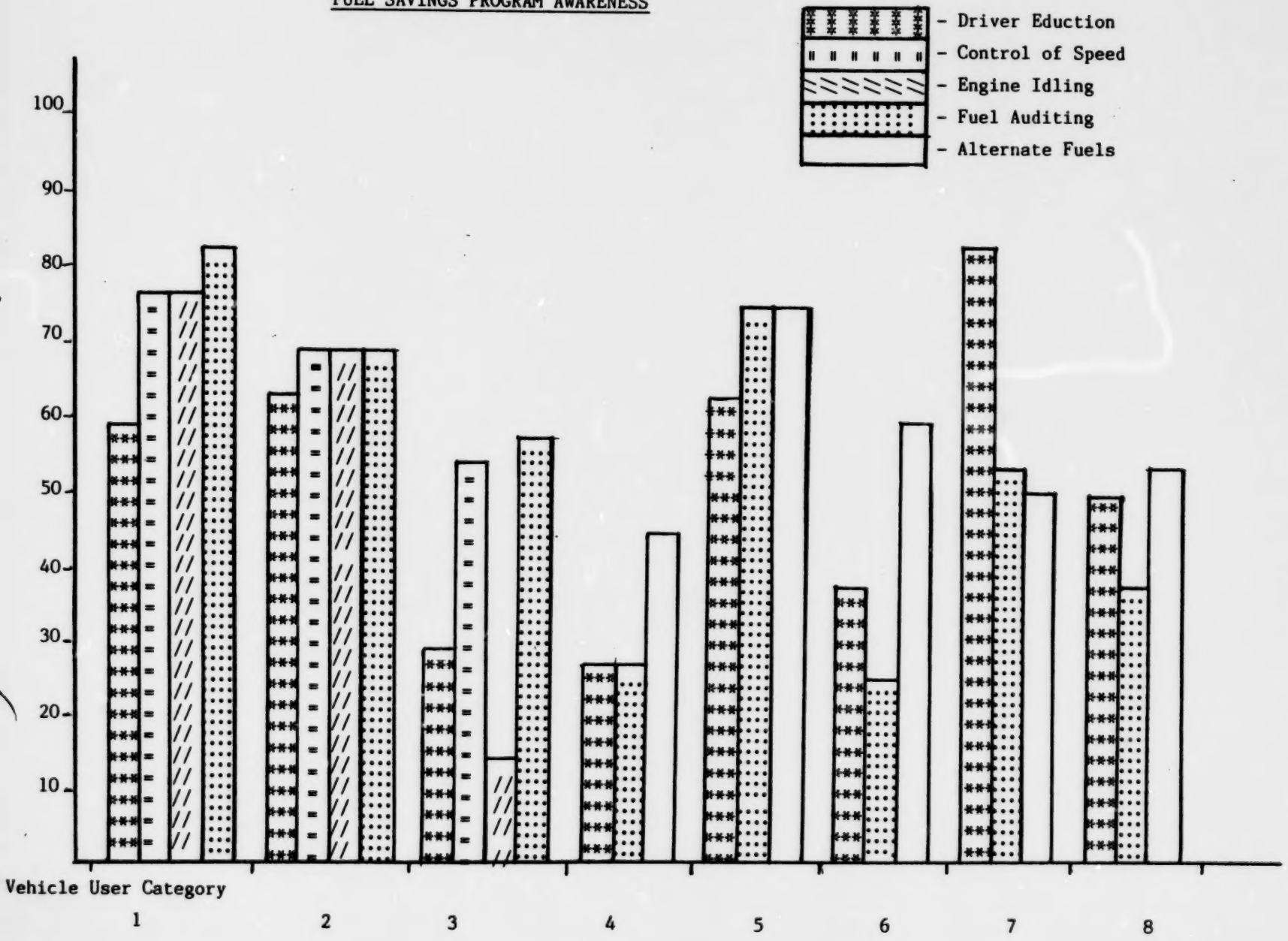


FIGURE 4-4

FUEL SAVINGS PROGRAM AWARENESS



4.0 LEVELS OF ENERGY CONSERVATION BEING IMPLEMENTED WITHIN THE TARGET GROUPS

A significant level of subjectivity is involved in the measurement of awareness. The intangible elements are greater than the tangible. Moreover, meeting a survey respondent face-to-face reveals the company and the person far more keenly than can be determined through a telephone interview; a visit to the premises provides more insight into commitment than just a mental image.

Another difficulty in assessing awareness is distinguishing between professed knowledge and actual subscription to energy conservation programs, versus what is actually occurring in road transportation. For example, some respondents avowed their trucks were not permitted to exceed 90 km/h and that speed was closely monitored and controlled through mandatory use of tachograph or speedograph recorders. The trucks of some of these companies, however, were observed by the consultant exceeding the 100 km/h speed limit. In other instances it was difficult to ascertain the difference between low awareness and complacency; one being as negative as the other but each representing a separate approach and challenge in the formulation and implementation of future energy awareness programs.

As part of the long term awareness picture, many large companies have developed sophisticated cost accounting, statistical and management information systems for monitoring equipment and driver performance. The small company owner-manager usually has regular first-hand experience in his grasp and may be able to react more quickly to correct or improve a fuel-sensitive situation. Systems may differ but awareness program implementation may be similar.

Extremely little concern for fuel conservation was expressed by several taxi and courier/messenger service operators in Calgary and Edmonton. The responsibility for fuel cost lies exclusively with the drivers; corporate income is derived from sale of fuel and provision of car washing facilities as well as commissions on fares. Many companies engaged in transportation act only as service or freight brokers with little concern for costs other than administration or overhead expense.

Drivers are highly cost conscious. Those operating on gasoline are fully aware that their propane counterparts are spending $12.00 to $15.00 less per working shift on fuel but the current surplus of taxis and low utilization factor resulting from the state of the economy does not produce enough income for many driver-owners to consider the capital cost of conversion ($750 - $1,000, including Federal rebates).

Vancouver and Winnipeg reportedly have a much higher alternate fuel conversion factor (propane and natural gas) in their taxi fleets than Calgary or Edmonton but they also have a higher proportion of company-owned cabs. The B.C. Government (and some other provincial governments) offer additional financial rebate incentives in addition to Federal incentives. One Calgary taxi company operations manager offered the opinion that the Alberta Government should provide additional rebates (similar to B. C.) for cab owners who convert from gasoline to propane or natural gas but that such rebates should only apply to 4 or 6 cylinder engines; a two-pronged cost and energy savings solution! This represented in the consultant's view a high awareness response, but possibly a mis-directed responsibility.

Within each target group there were both high and low awareness responses to the survey questionnaire. The sampling level for each individual group was quite small, therefore the variance within groups is quite large. Levels of awareness criteria between groups may be more significant than indicated in Section 3 awareness summaries.

In addition to surveying vehicle user groups, discussions were held with truck dealers in Calgary to determine levels of awareness exhibited by truck operators when specifying and purchasing vehicles.

All dealers interviewed indicated that company fleet buyers (heavy trucks), generally demonstrate a level of "awareness" that is significantly greater than an owner-operator in the vehicle selection and purchase process.

The used vehicle market must also be considered in terms of awareness evolution. As new generation, more fuel-efficient vehicles enter the user marketplace, older, less efficient vehicles find new owners. In the light vehicle category - cars, pickups, vans - vehicle life is often determined by engine life. Following five to seven years service (less under severe operating conditions) scrapping the vehicle and buying new is a lesser cost alternative to engine overhaul or replacement.

Medium or light-heavy vehicles operate mainly in an urban environment and because of low annual distance travelled may be kept in service many years. An engine overhaul or replacement is usually less costly than vehicle replacement, and opportunities exist for replacing with more fuel efficient engines or converting to alternate fuel.

Heavy vehicles are usually replaced by fleet owners at predetermined distance or time intervals, often following one in-frame engine overhaul but prior to engine replacement. Depending upon condition of frame, cab and other components, some heavy trucks may be kept in service for well over two million kilometres - starting out as linehaul units, finishing as short haul gravel or farm trucks. At each engine replacement an opportunity exists to install the latest in fuel-efficiency engines, or downsized engines if the vehicle usage application has changed. This may also involve changing transmissions and differential ratios to maintain a high standard of fuel efficiency.

The peripheral "awareness" factors outlined above were not addressed in the survey but do have significant impacts on fuel economy between various user categories not reflected in the awareness summaries.

This awareness difference by fleet owners is manifested in more circumspect specification of trucks - the most appropriate power train for the hauling acitvity, the most aerodynamically efficient, at the lowest possible initial costs. They also indicated that this awareness gap between the fleet and owner-operator buyer has narrowed over the past few years as a larger number of owner-operators are trading "image" for economy.

Traditionally, the lease operator has opted for a general purpose vehicle, often a "showroom" or off-the-shelf model that has lots of chrome, a deluxe interior, a higher capacity (than needed) engine and many accessories which increase the weight of the unit with an equivalent loss in payload. As the lease operator does not have the purchasing leverage of the fleet buyer, he may pay $15,000 - $25,000 more for a tractor which can extend his depreciation schedule and/or increase his total cost of financing. In addition, many lease operators tended to purchase higher speed vehicles to improve their revenue when being paid by distance. The more current and common method of payment, according to a percentage of trip revenue coupled with more stringent control of speed by companies utilizing lease-operators have promoted a higher level of fuel cost awareness among the driver-owner sector.

5.0 STATE-OF-ART TECHNOLOGY FOR POTENTIAL ENERGY SAVINGS

Many survey respondents indicated that the majority of improvements in efficiency of vehicles have occurred during the past five years. The improvements were, by and large, the result of more intensive engineering on the part of engine and vehicle manufacturers prompted by the energy crisis period of 1973-74, the rising threat of import competition, plus more stringent regulations governing a wide range of mandatory refinements, including exhaust emission, engine noise and safety in addition to improved fuel consumption.

5.1 LIGHT VEHICLES (generally under 5,500 kg GVW)

In the early 1970's there was, in fact, a decline in vehicle gasoline fuel efficiency on many North American made cars and light trucks due to the installation of catalytic systems designed to reduce exhaust pollution. Many buyers counteracted by selecting larger engine options. By the late 1970's, some recovery of energy efficiency had occurred through redesign of combustion chambers, improving alloys used in engine manufacture, introducing electronic ignition and fuel injection systems, reducing torque loss in automatic transmissions, plus providing small vehicle diesel engine and alternate fuel options.

Although there have been improvements in small vehicle engine technology over the past five years, many operators feel manufacturers have only regained some of the fuel efficiency levels of the pre 1970's. Labour cost savings have occurred due to the extended service intervals incorporated into newer vehicles (eg. fewer oil changes, tune-ups, wheel bearing replacement, etc.) but these have largely been offset by the higher level of expertise and technology (eg. electronic engine analyzers) required for effective maintenance.

For severe service application - rural, high mileage, industrial - most companies continue to select North American vehicles over their downsized, imported counterparts. The impact of import sales, however, has resulted in a wider size selection range for buyers to choose from for specific usage, from domestic manufacturers.

5.2 MEDIUM TRUCKS (5,000 - 14,000 kg GVW)

The largest majority of these vehicles operate on the urban road network engaged in residential delivery, tradesmen services, freight pickup and delivery, household goods removals and private freight operations. They tend to be low mileage vehicles with a high proportion of terminal or waiting time. Because of the relatively low mileage, they also tend to remain in service longer than many other categories of vehicles (10 - 15 years is not uncommon). Therefore, the introduction of improved medium vehicle technology into the commercial transportation marketplace is slower than for other size categories. Manufacturers still produce gasoline engines for medium-sized vehicles but the majority of prudent buyers are now opting for diesel engines or converting to propane. As age and mechanical attrition occur, it is unlikely that many gasoline-powered medium trucks will be seen in future years.

In the medium truck marketplace there has also been growing competition from imports. Japanese Hino trucks (diesel) are manufactured in B.C.; the technology and engines are Japanese, the majority of other content is Canadian. Volvo of Sweden and Mercedes-Benz of Germany (both diesel) are also making strong overtures for a share of the medium truck market in North America.

5.3 LIGHT HEAVY TRUCKS (14,000 - 23,000 kg GVW)

Similar to the medium vehicle category, age and natural attrition will herald the demise of the gasoline engine for light-heavy vehicles in future. New purchases will be diesel or alternate fuel options, with diesel predominating. There are instances of aged gasoline-engined trucks being retained in concrete transit mixer fleets, city service vehicle fleets and other low mileage applications, but they are often retained only as "backup" units to fill in during peak activity periods (summer) at a lesser cost option to replacement.

5.4 HEAVY TRUCKS (23,000 - 53,500 kg GVW)

Almost 100 percent of vehicles in this size category engaged in linehaul operations (intercity, interprovincial) are diesel-powered. In urban operations, gasoline engines are not uncommon but many companies have converted to propane or are specifying diesel engines on new purchases.

Companies often redeploy older highway trucks which have reached the end of their economic useful lives into urban operations for local pickup and delivery, gravel hauling, etc.

According to survey respondents, the greatest advances in fuel efficiency technology have occurred with diesel engines. Over the past five years a totally new generation of "formula" type high torque rise engines have appeared. These engines also incorporate more sophisticated aspiration systems involving turbo-chargers, after-cooling systems plus improved fuel injection techniques.

The major improvement factor in diesel technology is the change in the torque rise curve. Previously, engines operated most efficiently in the 1,850-2,200 rpm range and gears had to be shifted within this range to avoid "lugging" and damaging the engine. New engines can be operated as low as 1,200 rpm without damage and perform well at cruising or top speed in the 1,700-1,900 rpm range. The reduction in fuel consumption has been proportional to reduced engine rpm's - 10 - 15 percent and recent increases in gross vehicle weight has not significantly affected this reduction.

It is interesting to note, however, that in case studies conducted under the Ontario "Trucksave" program, it was found that "<u>if drivers were not educated in the (driving) techniques to use with the new high torque rise engines, the (fuel) savings would be negligible.</u>" [1]

New diesel technology introduction into the heavy truck category has slowed appreciably during the past two to three years due to the poor economic climate. Fewer new trucks are being purchased. However, many heavy truck operators have achieved equivalent fuel consumption savings with older equipment through reducing speed, changing differential ratios, curtailing idling time, using radial tires and implementing improved aerodynamics.

Many truckers who have combined both new high torque rise engines <u>and</u> more cost effective operating policies report <u>achieving fuel consumption savings in the magnitude of 25 to 30 percent.</u>

1 Source: Trucksave, "A Case History", Energy Ontario, undated.

Heavy truck operators have one advantage over buyers of light, medium or many light-heavy trucks. The majority of heavy trucks are custom fabricated precisely according to the buyers' specifications. Only Mack Truck in North America produces a factory assembly line truck incorporating Mack components (and Mack will install outside engine and component options upon request). Both truck and engine manufacturers offer computer-assisted systems for specifying vehicles. All the parameters of the proposed transport activity - speed, terrain, condition of road, cargo description, distance, trip cycle times, climatic conditions, fuel cost, etc. - are entered into the program and a "profile" of the most efficient truck is produced by the computer. Selection of engines and components is still largely based on traditional preference according to the buyers' personal experience and desire to maintain equipment standardization within the fleet.

Unlike gasoline engines, diesel engine capacity is not a major criterion of fuel efficiency. A 400 hp engine may be more fuel efficient than, say, a 300 hp engine for a vehicle grossing 38,000 kg; a 350 hp engine may prove more efficient at gross vehicle weights of 53,500 kg. Speed of the vehicle, transmission and final drive ratios, but most importantly, driver proficiency, are the principal determinants of fuel efficiency.

5.5 FUEL CONSUMPTION AND COST COMPARISON

According to data published by "Trucksave" and CNG, diesel engines are 20 percent more energy efficient than gasoline engines; gasoline is 20 percent more efficient than propane; gasoline and natural gas efficiency is equal. These levels of efficiency tend to become far more pronounced in urban operations where a high proportion of vehicle idling occurs. At engine idle, diesels consume only 50 percent as much fuel as gasoline engines. The cost differential for diesel fuel is even more pronounced in an urban environment where significant vehicle idling is involved. As Table 5-1 following indicates, diesel is the least cost option fuel (except for natural gas) in all truck size categories, both for urban and highway operations:

TABLE 5-1

Consumption and Cost Comparison by Truck Size and Fuel Type

Vehicle Size	CONSUMPTION (litres per 100 km) Gasoline	Diesel	Propane	N. Gas	COST ($ per 100 km) Gasoline	Diesel	Propane	N. Gas
Light Trucks -5500 kg GVW								
Urban	28.0	22.4	33.6	28.0	11.51	7.41	9.74	3.64
Highway	22.0	17.6	26.4	22.0	9.04	5.83	7.66	2.86
Medium Trucks -14,000 kg GVW								
Urban	31.2	26.0	37.4	31.2	12.82	8.61	10.85	4.06
Highway	26.4	22.0	31.7	22.0	10.85	7.28	9.19	2.86
Light-Heavy Trucks -23,000 kg GVW								
Urban	56.4	47.0	67.7	56.4	23.18	15.56	19.63	7.33
Highway	37.2	31.0	44.6	37.2	15.29	10.26	12.93	4.84
Heavy Trucks 5 axle -38,000 kg GVW								
Urban	68.4	57.0	n/a	n/a	28.11	18.87	n/a	n/a
Highway	54.0	45.0	n/a	n/a	22.19	14.90	n/a	n/a
Heavy Trucks 7 axle -53,500 kg GVW								
Urban	82.8	69.0	n/a	n/a	34.03	22.84	n/a	n/a
Highway	68.4	57.0	n/a	n/a	28.11	18.87	n/a	n/a

Gasoline	41.1¢ per litre - retail pump price, Calgary
Diesel	33.1¢ per litre - retail pump price, Calgary
Propane	29¢ per litre equivalent(retail cost plus conversion cost amortized over one year)
Natural Gas	13¢ per litre equivalent (utility cost plus conversion and compressor system cost amortized over 5 years)
n/a	Not applicable to vehicle size category

Source: Consultant's estimate based on interviews

Assumptions:

. gas 20% lower efficiency than diesel

. gas 20% higher efficiency than propane

. gas efficiency equal to natural gas

5.6 A SPECIAL NOTE ON FUELS

5.6.1 Diesel Fuel

Alberta refineries produce a lighter viscosity, lower btu per litre, "winter grade" diesel fuel which is generally marketed between October and April each year. During this period summer grade fuel is not available. Several companies indicated that their vehicles do not obtain as efficient consumption from winter fuel (excluding additional weather-related or engine idling consumption) as from summer fuel although no seasonal fuel cost adjustment occurs. Some truckers claim to use 20-25 percent more fuel per 100 km of distance travelled during winter. Others say they achieve better distance on fuel purchased in the U.S., even during summer operations.

One charter bus operator claims diesel fuel from Alberta refineries is high sulphur content and causes early valve "burn-out" in his company's naturally-aspirated two-cycle diesel engines. Other reports suggest that Alberta-refined diesel fuel contains a lower cetane (the rating determines the speed of ignition) rating than fuels refined elsewhere, resulting in reduced fuel efficiency.

No attempt was made to investigate or verify the validity of these claims.

5.6.2 Propane

There are mixed feelings about propane from both initiated and uninitiated vehicle users. Several early convertees reported metering and carburetion difficulties which vastly increased consumption or which caused early exhaust valve failure on older, lower-compression engines. The fear of leakage and explosion is still strong, regardless of the improved installation systems which have been developed.

In addition, the fear that future propane shortages will occur or that the price will rise to meet or exceed gasoline prices is prevalent among many vehicle operators. They are not aware that in Alberta, propane is derived from natural gas, not from refined liquid fuels as is the case in Eastern Canada and much of the U.S. Scarcity of propane outlets is also an inhibiting factor in conversion decision, as many outlets specialize in filling barbeque and recreational vehicle cylinders rather than vehicles.

The cost of converting a light vehicle to propane is approximately $1,000.00, including the Federal Government rebate. The conversion payback period is usually between eight months to a year for a high annual distance commercial vehicle.

Some vehicle users have inadvertently offset the potential cost savings benefits of propane by upsizing engines. One disabled person's bus operator recently purchased vehicles with 7550 cc engines, converted to propane. The fuel cost savings over the 5800 cc gasoline-powered buses in the fleet are negligible.

Based on interviews, the positive or negative benefits of propane appear to be largely based on "word of mouth" experience between fleet owners; not upon technically or educationally applied reason resulting in conversion.

5.6.3 Natural Gas

Several companies in Alberta (primarily resource-based) have converted to natural gas in their service vehicle fleets. One school bus operator has converted a significant number of his fleet. These are all dual-fuel conversions - vehicles which operate on both gasoline and natural gas.

The major restrictions to natural gas conversion include the almost total absence of "quick-fill" outlets, the high cost of conversion ($2,300 - $3,000 including Federal rebate), and the reduced daily distance range of vehicles. For example, to convert a taxi to natural gas would involve utilizing one third of available luggage compartment space for the high pressure tanks for a daily distance range (natural gas only) of approximately 240 km. "Quick-fill" or "slow-fill" compressor systems cost between $45,000 and $180,000, depending on the fleet size. According to CNG, the minimum payback period on a minimum 10 vehicle fleet, including both conversion and compressor cost, is about five years for high annual distance vehicles, even at the current industrial natural gas price of approximately seven cents per litre equivalent. Most light vehicles are retired from commercial service in less than five years.

6.0 OPPORTUNITIES FOR IMPROVING ENERGY CONSERVATION AWARENESS

6.1 ENERGY CONSERVATION BRANCH

Most large for-hire trucking companies subscribe to a variety of trade and technical journals and receive bulletins from organizations like the Alberta and Canadian Trucking Associations. There are also school bus and gravel haulers associations in Alberta, although they appear to be less active (according to members) in distributing information than their common-carrier counterparts. In the past there were also associations for independent truckers and heavy oilfield haulers; no trace could be found of the former and the latter organization (Canadian Heavy Oil Field Haulers Association) curtailed activities in late 1983.

The Alberta Trucking Association has imported several copies of the Ontario Trucksave visual education program (a slide presentation) which is available to its members. The frequency of its use by members is reportedly low. Some larger firms have obtained visual aid programs on driver and mechanical education from American sources. Several companies reported that they hold scheduled meetings with drivers and mechanics, often in conjunction with safety or management-employee relations, during which slide presentations are made and guest speakers discuss topics related to energy conservation, state-of-art technology in vehicles, driver, mechanical and operational education.

Other industrial education programs are also available for various truck system managers or operators. The Portland Cement Association offers three day "Management of Materials Dispatch" seminars at its headquarters in Skokie, Illinois, and there are numerous other educational forums for traffic and distribution managers.

However, only a minute portion of the total education package extends down to the mechanic or driver level. The schoolroom for the driver-owner is likely to be the truck-stop coffee shop. Commercial driver education schools tend to produce categories of license qualifications, not professional drivers. By prudent truck operator standards (highway trucks) five to ten years of practical driving experience combined with ongoing educational programs in vehicle technology, highway safety, driving techniques and attitude developmentare required to create a "professional" driver.

In the smaller vehicle categories, driver training is more likely to be limited to a "route or truck familiarization" check-ride or attendance at a defensive driving course. In most instances, little or no training takes place. Large utility and service vehicle fleet operators, for instance, are limited to buying automatic transmissions because of lack of available skills or knowledge in the use of clutch and gears. According to recent graduates of high school driver education programs, fuel energy awareness, per se, is not a component of the training curriculum.

The opportunities for improving energy awareness and promoting fuel conservation in Alberta, therefore, are significant.

They include, but are not limited to:

- incorporating awareness, outlining the relative operating merits of alternate fuels, mechanical options, speed and other factors at the grass roots level; student driver education programs

- directing a steady stream of educational and technical information to fleet operators and drivers not exposed to transportation association or trade awareness programs; lease operators, utility and service vehicle fleet operators, the majority (if not all) of private truckers, courier and messenger services, school bus operators, taxi companies and drivers

- mounting a media campaign; television, radio, newspapers, periodicals

- conducting vehicle energy awareness seminars that reach from senior management to the driver level

- conducting alternate fuel cost awareness seminars in conjunction with the marketing programs of companies like ICG or CNG

- preparing, in conjunction with Alberta trucking companies and vehicle manufacturers, an extensive array of audio-visual educational programs for use by the Government in promoting greater energy awareness

- directing energy awareness information to service users as well as vehicle operators (eg. School Districts which issue contracts to bus operators).

Based on survey interviews, fleet owners and commercial vehicle operators would be highly receptive to Government-sponsored promotion. To create a uniquely Albertan awareness program, however, the approach to promotion should not be undertaken in isolation of the vehicle operator community. Their experiences, their solutions to problems, their attitudes and their local expertise must be reflected in promotional efforts to provide substance and validity to any program.

6.2 JOINT GOVERNMENT AND INDUSTRY COOPERATION

Many interview respondents, particularly in the heavy truck highway operations category, expressed concern over the Alberta Government's intentions towards promoting energy awareness. Many cite the recent increase from 90 to 100 km/h as being in total contradiction to the past decade (and money) they have spent educating drivers to the lower speed in the interests of both fuel conservation and safety. They also indicate that a 10km/h penalty-safe margin has always been observed by enforcement officers so that the new 100km/h speed limit is, in effect, a 110 km/h speed limit. As the majority of "prudent" truckers now specify a maximum of 93 - 96 km/h on new equipment purchases, they also feel that travel speed fragmentation between various categories of highway users will be exacerbated, not alleviated, by the speed increase.

The Alberta Trucking Association and the majority of its membership endorse the Canadian Truck Association recommendation of 90km/h for heavy trucks. Many non-association members in the private trucking sector also endorse this recommendation.

Municipal governments also come under criticism for allowing or imposing systems which increase energy consumption. These include restricting trucks on urban arterials (funded 66 percent by the Provincial Government) which creates greater route circuity; for approving construction of buildings or complexes in the Central Business Districts which do not have adequate off-street or off-lane parking and loading facilities (increased engine idling and wage costs); for time-of-day and vehicle size restrictions which affect vehicle utilization.

The question posed to truckers in the survey was designed to draw opinions concerning the role which could be played by themselves, by vehicle manufacturers and governments in promoting greater energy awareness. The responses, in descending order of response frequency, are summarized in Table 6-1.

TABLE 6-1

The Role of the Trucking Industry, Vehicle Manufacturers and Governments in Promoting Greater Energy Awareness

Survey Response	Vehicle/Operation Category	Perceived Source of Action
1. Reduce speed to 90km/h	Inter and Intraprovincial Heavy Truck Operators	Alberta Government
2. Standardize GVW of Trucks across Canada (and North America)	Interprovincial & intra-provincial operators	Federal Government, Provincial Government
3. Driver Education and Awareness	All	Alberta Government
4. Produce more energy-efficient Vehicles	Utility & Service Vehicles, School buses, Couriers, Heavy Truck Operators	Vehicle Manufacturers
5. Increased Awareness promotion and Technical Information	Couriers, Private truckers, Buses	Alberta Government
6. Promote Alternate fuels; Provide Incentives	Utilities' Service Vehicles, School Buses, Taxis	Alberta Government Taxi Commissions
7. Promote Greater awareness among Lease-Operators	Heavy Truck Operators, both company-owned & owner-driver	Alberta Government
8. More Stringent enforcement of Speed limits	Intra-provincial Heavy Truck Operators	Alberta Government
9. Better roads/Bridges	Heavy Truck Operators	Alberta Government
10 Mandatory downsizing of Engines	Taxi	Taxi Commissions
11 Reduce Idling time of Vehicles	All	Industry responsibility
12 More Intensive fuel Savings Programs	Heavy Trucks, Utilities Service Vehicle Fleets	Industry responsibility
13 Higher Quality Diesel Fuel	Light-Heavy, Heavy Trucks	Refiners

7.0 ADDITIONAL OPPORTUNITIES FOR EXPANDING ENERGY AWARENESS

7.1 WITH TRANSPORTATION SERVICE USERS

Expanding the level of energy awareness among vehicle users and encouraging them to take voluntary action for operating more efficiently represents only one level of awareness opportunity. There are possibly even greater opportunities for achieving higher transportation fuel efficiency by making service users, not truck users, the objective of awareness programs.

Economic conditions and competition provide a measure of efficiency enforcement in many vehicle user categories - particularly in the for-hire sector where fuel and wage costs constitute the two major operating cost expenses. This is reflected in many of the trends which can be currently observed:

- the value of fuel, at today's prices, exceeds the perceived value of time for the prudent highway transporter who mandates his trucks at a top speed of 90km/h

- many taxi and messenger/courier service operators have transferred the responsibility for fuel costs to owner-drivers by divesting themselves of company-owned vehicles. The mid-size North American automobile has all but disappeared from the urban messenger scene, for example

- as profit margins have shrunk and costs have risen, utility and service vehicle fleet operators have been compelled to seek more efficient methods of vehicle operation; more effective "zoning" to reduce non-productive travel distances, downsizing of vehicles and engines, conversion to lower cost alternate fuels such as propane or natural gas.

The danger is always present that the lessons of today could be forgotten in a major economic upswing of the future. One of the objectives of awareness training is a continuing thrust towards improvement and reinforcement of energy efficiency principals.

A major question arises as to how well service users audit the cost components of the service providers (vehicle operators). There are proven fuel cost savings of 40 to 50 percent available by converting school buses to propane, for example, but School Districts continue to issue contracts to bus companies deploying less fuel efficient equipment. Politicians, as a rule, concern themselves more with capital cost budgets (new equipment purchases) than with operating cost budgets which is where the greatest savings potential lies. Alberta city vehicle fleets, with few exceptions, are far less fuel efficient than their "for-hire" counterparts.

7.2 IN URBAN GOODS TRANSPORTATION

In the same broad vein, the question must be asked, "where, and with which vehicle user groups will energy awareness programs be most effective?" The volume of freight moved within a city is estimated at between four and seven times the volume which is transported between cities and other cities or regions. Between 45 and 73 tonnes per person are moved within Canadian cities each year. Recent residential, commercial and industrial growth patterns in many Alberta cities suggest that Alberta may well exceed the national average.

Table 7-1 indicates urban goods movement volumes per capita:

TABLE 7-1

Annual Volumes of Goods Per Capita
Moving Within Canadian Cities

	Upper Range (tonnes)	Lower Range
Food	3.63	2.04
Beverages	.59	.50
Paper	1.00	.91
Lumber	1.18	1.00
Garbage	1.59	1.13
Mail, parcels, air freight	.30	.27
Bulk and Construction	23.59	16.78
Fuels	4.26	2.72
Other	36.44	20.00
Total	72.78	45.35

Source: "Urban Goods Movement", an educational/information document compiled by the Greater Vancouver Regional District, February, 1982.

If the urban goods movement patterns are considered, a clearer view of the way motive fuel resources are utilized emerges, as per Table 7-2:

TABLE 7-2

Weight Distribution of Shipments

Average Shipment Weight (kg)	Pickups		Deliveries	
	% of trips	% of weight	% of trips	% of weight
0 - 45	85	4	80	4
46 - 906	7	6	14	8
907 - 4,536	4	12	3	10
over 4,536	4	78	3	78

Source: "A Profile of Urban Goods Flow in Calgary" Vol 3 Urban Goods Movement Report Series, Transport Canada, December, 1974. (within 2 percent of estimates tabled by the GVRD in 1982)

The entire urban transportation scene, as demonstrated by statistics, presents the most significant challenges for improving vehicle energy efficiency when considered in the context of tonne or passenger kilometres per unit of fuel consumed.

In addition, cities present other opportunities for fuel savings in the way they are institutionally planned and governed. The Alberta Trucking Association submitted a report to the City of Edmonton in the late 1970's which indicated that additional route circuity resulting from a series of arterial closures and adjustments cost the people of Edmonton three cents more each per kg of freight moved within the city, compared to Calgary - principally split between fuel and wage costs. At 75 tonnes per capita the additional fuel cost resulting from reducing road network efficiency amounted to approximately $25.00/year for each citizen. Table 7-3 outlines fuel savings opportunities (for freight only) which are feasible within an urban environment. With passenger and service vehicle movements included, the fuel saving potential is increased by at least 100 percent.

TABLE 7-3

Potential Fuel Saving in Urban Trucking

Savings Component	Criteria	Potential Savings (%)	
		Per Vehicle	Total Urban
Increase Average Speed		20	9.8
Decrease traffic Signals	Light trucks	6.4	
	Medium trucks	9.1	
	Heavy trucks	9.0	
Reduce engine idling	Shut down @ end points		9.7
Reduce congestion	In CBD's	11-12	
Increase truck utilization	Match vehicle to load	to 40	
	Largest vehicle	to 50	
Dieselization	Light trucks	9-16	
	Medium trucks	30	
	Total urban fleet	15-20	
Improve driving habits	Fuel economy indicators	5	
	Caution	7	
	Avoid rapid starts/stops	17	
Rationalized Land Use	Freight/passenger locational factors		1,000
Freight Consolidation	100% participation		47
	25% participation		10
State of Art vehicle technology	Light trucks	25-40	
	Medium trucks	70-80	
	Heavy trucks	15-20	

Source: "Potential Energy Conservation in Urban Commodity Flow", J.F. Morrall, M.A. Sargious, R.R. Thompson, University of Calgary, Civil Engineering Research Report #CE78-5, May, 1978.

On the highways of Alberta the maximum achievement of an energy conservation awareness program would be measured in terms of 15 to 20 percent; in the cities, several multiples of 100 percent, if the awareness of both vehicle and service users (community at large) is increased dramatically.

8.0 AWARENESS SURVEY CONCLUSIONS

Section 3.0 of this report provides comparative awareness data on eight selective vehicle user categories; the levels to which each category has in the past, is currently, or is moving towards responding to both fuel consumption and cost reduction opportunities. Sections 5.0, 6.0, and 7.0 highlight opinions expressed by vehicle operators during the survey, outline awareness trends occurring in the vehicle manufacturing, vehicle user, and service user sectors, and indicate potential activity and action centres for enhancement of fuel consumption and cost awareness.

The Alberta community at large is affected by the energy wastage and fuel costs of commercial vehicles. Any awareness promotion, however, must be structured to "zero in" on vehicle user sectors where tangible and measurable downstream savings benefits can be obtained. An awareness program directed towards the for-hire sector, particularly heavy trucks engaged in highway operations, would likely elicit the highest interest. However, overall fuel cost savings benefits resulting from targetting a program at this vehicle user category would predictably be the lowest as this group already operates closest to the leading edge of fuel efficiency of any of the groups surveyed.

Table 8-1, following, summarizes energy "awareness" interest levels for each of the user categories; indicates perceived levels of program subscription likely to occur; and highlights where significant fuel savings benefits can be achieved:

TABLE 8-1

Target Areas for Awareness Programs

User Category	Heavy Tr. Company	Heavy Tr. Drv.-owned	Private Hwy.	Private Urban	Utility/ Service	Mssgr./ Courier	Taxis	Buses
AWARENESS:								
Program Interest								
- Sr. Mgemnt.	High	High	Low	Low	High	Medium	Medium	Medium
- Operations	High	High	Medium	Low	Medium	Medium	Medium	Medium
- Drivers	High	Medium	Medium	Low	Medium	Low	Medium	Low
PROBABLE LEVEL OF SUBSCRIPTION TO AWARENESS PROGRAMS:								
- Sr. Mgemnt.	High	Medium	Low	Low	High	Low	Low	Medium
- Operations	High	Medium	Medium	Low	Medium	Low	Low	Medium
- Drivers	High	Medium	Medium	Low	Medium	Medium	Medium	Low
BENEFITS TO BE OBTAINED THROUGH SUBSCRIPTION TO AWARENESS PROGRAMS								
- Lower Fuel Costs	Low	Low	Medium	High	Medium	High	High	High
- Alternate Fuels	Low	Low	Low	High	High	High	High	High
- Higher Technlgy.	Low	Medium	Medium	High	Medium	High	Medium	High
- Improved Driver Skills	Medium	Medium	Medium	High	Medium	High	Medium	High
- Service User Savings	Medium	Medium	Medium	High	High	High	High	High
- Target Group Priority	8	7	6	1	5	3	4	2

APPENDIX "B"

SURVEY QUESTIONNAIRES

1. Direct contact interviews - Heavy Trucks
2. Direct contact interviews - Light Vehicles
3. Telephone interviews - Heavy Trucks
4. Telephone interviews - Light Vehicles

ALBERTA ENERGY & NATURAL RESOURCES
ENERGY CONSERVATION AWARENESS SURVEY

Date: _____ Tel: _____ Nature of activity: _____

Company: _____ _____

Respondent: _____ Vehicle size/type: _____

Position: _____ _____

I. GENERAL POLICY & AWARENESS OVERVIEW

1 | 2 | 3 | 4 | 5

1. Does your firm have a specific energy conservation policy? yes no

2. Has a manual or policy statement been prepared which outlines specific fuel savings objectives for company employees (especially vehicle drivers)? yes no

3. Does your company have anyone designated as as Energy Conservation Officer with distinct responsibility for implementing and monitoring policy? yes no

4. What is the total annual distance travelled by your vehicles?
   ... fleet average _____ km
   ... single vehicle average _____ km

5. What do you spend annually on fuel?
   ... for your entire fleet $_____
   ... per truck (size:_____GVW) $_____

6. What percent of fleet or single vehicle operating costs are represented by fuel costs? _____%

7. What percentage do you estimate you have been able to improve fuel consumption of your vehicles over the past 5 years _____%

8. Within existing parameters of equipment and operating technology, do you believe that additional savings can be achieved?
   ... minor savings yes no
   ... significant savings yes no

9. What is your opinion of the current level of energy awareness that exists within your operational category?
   ... is it high yes no
   ... is it low yes no
   ... are firms or individuals too complacent yes no

10. What relative importance does your firm attach to energy conservation or fuel consumption savings?
   ... top priority yes no
   ... a lower priority (specify) yes no

11. What percent of your annual operating budget is allocated specifically to energy programs? _____%

II. APPLICATION OF ENERGY SAVINGS DEVICES

		Savings estimated	Savings audited	1	2	3	4	5
1. Drag reduction devices								
...cab-mounted deflectors	yes no	____	____					
...trailer/van-mounted deflectors	yes no	____	____					
...cab-van gap-mounted deflectors	yes no	____	____					
...special streamlining	yes no	____	____					
2. Temperature-controlled fans	yes no	____	____					
3. Tires								
...bias ply	yes no	____	____					
...radial ply	yes no	____	____					
...'low profile' radial	yes no	____	____					
4. Single drive axles	yes no	____	____					
5. Turbo-charged engines	yes no	____	____					
6. Automatic transmissions								
...highway application	yes no	____	____					
...off-highway application	yes no	____	____					
7. Tachometers								
...mandatory use by drivers	yes no	____	____					
...trip 'logging' by drivers	yes no	____	____					
8. Other fuel efficiency devices								
...pyrometers	yes no	____	____					
...'on board' computers	yes no	____	____					
...consumption efficiency indic.	yes no	____	____					
...other(specify)	yes no	____	____					

III. IMPLEMENTATION OF ENERGY CONSERVATION PROGRAMS

		Savings						
		estimated	audited	1	2	3	4	5
1. Increased dieselization								
...fleet totally diesel-powered	yes no	____	____					
...transition to diesel in progress	yes no	____	____					
2. Alternate fuels								
...propane	yes no	____	____					
...natural gas	yes no	____	____					
...other (alchohol)	yes no	____	____					
3. Energy-intensive maintenance								
...more frequent wheel/chassis align.	yes no	____	____					
...fuel delivery systems	yes no	____	____					
...improved recording systems	yes no	____	____					
4. Control of speed								
...maximum 90 km/h (controlled)	yes no	____	____					
...incorporated into specifications	yes no	____	____					
5. Driver training/re-training								
...subscribe to 'packaged' programs	yes no	____	____					
...employ 'in-house' programs	yes no	____	____					
...incentive programs for drivers	yes no	____	____					
6. Engine idling								
...shut down at end points	yes no	____	____					
...provide cold weather heating	yes no	____	____					
7. Special fuel auditing programs								
...trip auditing	yes no	____	____					
...daily, weekly, monthly (indicate)	yes no	____	____					
8. Routing and load optimization								
...use of simulation models	yes no	____	____					
...schedule outside of peak traffic	yes no	____	____					
...two-way radio control	yes no	____	____					
9. Upgrading vehicle specifications								
...new generation 'lean burn' engines	yes no	____	____					
...in-house research and development	yes no	____	____					
...other (specify)	yes no	____	____					

IV. NEW TECHNOLOGY

			1	2	3	4	5
1. Do you feel your firm is able to keep abreast of technological advancements in vehicles and systems?	yes	no					
2. Where do you obtain most of your technological information from?							
...trade magazines and journals	yes	no					
...manufacturers' bulletins	yes	no					
...other carriers' experiences	yes	no					
3. What can be done by your industry, by manufacturers, or by government to promote greater energy awareness?							
OPINION:							

ALBERTA ENERGY & NATURAL RESOURCES
ENERGY CONSERVATION AWARENESS SURVEY

Date: Tel: Nature of activity:

Company:

Respondent: Vehicle size/type:

Position:

I. GENERAL POLICY & AWARENESS OVERVIEW

1. Does your firm have a specific energy conservation policy? yes no

2. Has a manual or policy statement been prepared which outlines specific fuel savings objectives for company employees (especially vehicle drivers)? yes no

3. Does your company have anyone designated as as Energy Conservation Officer with distinct responsibility for implementing and monitoring policy? yes no

4. What is the total annual distance travelled by your vehicles?
   ... fleet average _____km
   ... single vehicle average _____km

5. What do you spend annually on fuel?
   ... for your entire fleet $_____
   ... per truck (size:_____GVW) $_____

6. What percent of fleet or single vehicle operating costs are represented by fuel costs? _____%

7. What percentage do you estimate you have been able to improve fuel consumption of your vehicles over the past 5 years _____%

8. Within existing parameters of equipment and operating technology, do you believe that additional savings can be achieved?
   ... minor savings yes no
   ... significant savings yes no

9. What is your opinion of the current level of energy awareness that exists within your operational category?
   ... is it high yes no
   ... is it low yes no
   ... are firms or individuals too complacent yes no

10. What relative importance does your firm attach to energy conservation or fuel consumption savings?
   ... top priority yes no
   ... a lower priority (specify) yes no

11. What percent of your annual operating budget is allocated specifically to energy programs? _____%

1 2 3 4 5

LIGHT VEHICLES

(cars, panels, pickups, stake trucks and P & D vans up to 14,000kg GVW)

II. VEHICLE SPECIFICATIONS RELATED TO FUEL CONSUMPTION SAVINGS

1 2 3 4 5

1. On present fleet vehicles, or on anticipated future purchases, are the following criteria considered in the selection process:

...reduction in over-all size (a smaller unit that offers the same general capacity)		yes	no
...a smaller engine		yes	no
...alternate fuels	diesel	yes	no
	propane	yes	no
	natural gas	yes	no
...manual 5 speed transmissions		yes	no
...tires (e.g. new generation low profile radials		yes	no
...other options which may be available from some manufacturers	manual steering	yes	no
	temp. controlled fans	yes	no
	consumption indicators	yes	no
	front wheel drive	yes	no

III. MAINTENANCE PROGRAMS

1. With specific reference to fuel savings, have you made any adjustments in vehicle maintenance programs which differ from manufacturers' recommendations with respect to:

...wheel balancing or alignment	yes	no
...tire rotation and inflation monitoring	yes	no
...cooling system check and flush	yes	no
...brake inspection and adjustment	yes	no
...scheduled tune-up and fault analysis	yes	no
...other (specify)	yes	no

IV. OPERATING PROGRAMS RESULTING IN BETTER FUEL ECONOMY

1. Does your company have a driver training program? yes no

2. Do you have specific driver and/or vehicle activity monitoring programs? yes no

3. Do your dispatchers receive any training in route and load optimization techniques? yes no

4. On urban operations, are you able to schedule your vehicles to minimize conflicts with peak hour urban traffic? yes no

5. If no, to question 4, explain briefly why not

6. Outline any special programs your firm has implemented to assist in reducing fuel consumption and costs.

IV. NEW TECHNOLOGY

			1	2	3	4	5
1. Do you feel your firm is able to keep abreast of technological advancements in vehicles and systems?	yes	no					
2. Where do you obtain most of your technological information from?							
...trade magazines and journals	yes	no					
...manufacturers' bulletins	yes	no					
...other carriers' experiences	yes	no					
3. What can be done by your industry, by manufacturers, or by government to promote greater energy awareness?							
OPINION:							

ALBERTA ENERGY AND NATURAL RESOURCES
ENERGY CONSERVATION AWARENESS SURVEY

Date: _____ Tel: _____ Nature of activity: _____

Company: _____

Location: _____ Vehicle type: _____ Fuel: _____

Respondent: _____

Position: _____

I. GENERAL ENERGY POLICY & AWARENESS OVERVIEW

1. Has your company set any objectives or embarked on any programs directed specifically towards reducing fuel consumption and costs: 5 4 3 2 1
   - ...for facilities (terminals, workshops, etc.) yes no
   - ...for company-owned vehicles yes no

2. In your company, where does the area of greatest responsibilty lie with regard to monitoring, controlling, and if possible, reducing fuel consumption and costs:
   - ...with senior management yes no
   - ...with admin.,operating or maintenance personnel yes no
   - ...with drivers (or driver-owners) yes no

3. During the past 5 years have you been able to improve the fuel consumption of your vehicles: yes no
   - ...by what percentage _____%
   - ...through what principal course of action

   _____

4. Do you believe that additional fuel consumption and fuel cost savings are attainable and would they be significant yes no

5. In your opinion are vehicle operators highly aware of fuel costs and are doing everything they can to minimize fuel consumption of vehicles yes no
   - ...are they too complacent yes no

6. What percent of total vehicle operating costs do you estimate are fuel costs _____%

7. In terms of corporate priorities, does reduction in fuel consumption of your vehicles rank as a top priority item yes no

8. If your company employs driver owners or lease operators, do you feel that they operate as efficiently as they can in minimizing fuel consumption and costs yes no
   - ...if no, what are their main areas of deficiency

   _____

   _____

HEAVY VEHICLES
(3 axle or larger, single or combination)

5 4 3 2 1

1. Has your company implemented any programs for the specific purpose of improving fuel consumption or monitoring both the driver and fuel efficiency of vehicles:
   - ...fuel auditing — yes no
   - ...mandatory use of tachometers — yes no
   - ...more intensive maintenance — yes no
   - ...programs such as Ruhl — yes no

2. Does your company have a driver training program — yes no

3. If yes, are drivers re-educated before being assigned to a new model or engine type (formula) vehicle — yes no

4. Is the speed of your vehicles regidly controlled
   - ...at 90k/hr on highways — yes no
   - ...incorporated into specifications — yes no

5. Where applicable, does your company subscribe to the following energy savings devices:
   - ...wind deflectors — yes no
   - ...temperature controlled fans — yes no
   - ...radial tires (new low profile radials) — yes no
   - ...other (specify) _____
     _____

6. If your company employs driver owners or lease operators does it exercise any control over them with regard to fuel usage and efficiency — yes no

7. Do you have a policy regarding vehicle idling — yes no

8. What, in your opinion, can or should be done by vehicle operators, vehicle manufacturers or by governments to improve the fuel efficiency of vehicles or to promote greater energy awareness.

ALBERTA ENERGY AND NATURAL RESOURCES
ENERGY CONSERVATION AWARENESS SURVEY

Date: _____ Tel: _____ Nature of activity: _____

Company: _____ _____

Location: _____ Vehicle type: _____ Fuel: _____

Respondent: _____ _____ _____

Position: _____ _____ _____

I. GENERAL ENERGY POLICY & AWARENESS OVERVIEW

1. Has your company set any objectives or embarked on any programs directed specifically towards reducing fuel consumption and costs: 5 4 3 2 1
   - ...for facilities (terminals, workshops, etc.) yes no
   - ...for company-owned vehicles yes no

2. In your company, where does the area of greatest responsibilty lie with regard to monitoring, controlling, and if possible, reducing fuel consumption and costs:
   - ...with senior management yes no
   - ...with admin.,operating or maintenance personnel yes no
   - ...with drivers (or driver-owners) yes no

3. During the past 5 years have you been able to improve the fuel consumption of your vehicles: yes no
   - ...by what percentage _____%
   - ...through what principal course of action

   _____

4. Do you believe that additional fuel consumption and fuel cost savings are attainable and would they be significant yes no

5. In your opinion are vehicle operators highly aware of fuel costs and are doing everything they can to minimize fuel consumption of vehicles yes no
   - ...are they too complacent yes no

6. What percent of total vehicle operating costs do you estimate are fuel costs _____%

7. In terms of corporate priorities, does reduction in fuel consumption of your vehicles rank as a top priority item yes no

8. If your company employs driver owners or lease operators, do you feel that they operate as efficiently as they can in minimizing fuel consumption and costs yes no
   - ...if no, what are their main areas of deficiency

   _____

   _____

LIGHT VEHICLES

(cars, panels, pickups up to 14 000kg GVW)

1. Has your company subscribed to any of the following options related to reducing fuel consumption and/or the cost of fuel: 5 4 3 2 1

...downsizing of vehicles	yes	no
...downsizing of engines	yes	no
...driver education and training	yes	no
...more frequent or better maintenance	yes	no
...intensive fuel auditing programs	yes	no

2. Have you already, or are you considering purchases of vehicles which will operate on alternate fuels yes no

...diesel fuel (savings achieved_____)	yes	no
...propane (" " _____)	yes	no
...nat. gas (" " _____)	yes	no

3. In the operation and scheduling of your vehicles have any programs been implemented for:

...optimizing routes travelled by vehicles	yes	no
...optimizing payloads	yes	no
...scheduling outside of peak traffic periods	yes	no

4. What, in your opinion, can or should be done by vehicle operators, vehicle manufacturers or by governments to increase the fuel efficiency of vehicles or promote greater energy awareness.

APPENDIX "C"

EXPLANATION OF THE SCORING SYSTEM:

Limitations of the System

APPENDIX "C"

Explanations of the Scoring System: Limitations of the System

Scoring

Each question was scored on a five point system with five points being awarded for the highest perceived level of awareness response; one point for the lowest. The scoring decision was based upon a combination of the answer provided, indicated knowledge of the subject matter, and interest shown (express or implied) by the respondent in fuel cost savings and awareness concepts. All the points for one question within a single vehicle user group category were then added together and converted to a percentile of the total possible number of points which could be awarded. An example of the scoring system is shown as follows:

Question: "Does your company have a driver training program?"

Number of respondents in group	= 10
Maximum point score 10 x 5	= 50
Total of points scored by the 10 respondents	= 30
Group score percentage	= 60.0

Limitations of the System

The sum of total points within a question range category (eg. Management Awareness, Fuel Cost Awareness, Technical Awareness, Program Awareness) represent the levels of comparative awareness between various vehicle user group categories.

Many of the questions covered a broad range of user applications and were applicable to only a portion of the user group.(eg. wind deflectors not applicable to tanker or flat deck operations; use of alternate fuels not applicable to heavy linehaul trucks). In cases of non-applicability a median grade of three - a mid-range mark between one and five - was awarded to all respondents.

A recognizeable response bias occurred in several of the questions. A few examples of this bias are highlighted as follows:

Question: "How intensively do you audit your fuel consumption?"

Companies owning trucks audit fuel quite intensively and received high marks. Companies employing driver-owners - taxis, messengers, highway lease operators - audit much less intensively but it must be assumed that the drivers are highly conscious of their fuel consumption and costs and maintain extensive records for tax deduction purposes even if not for comparative operating cost monitoring.

Question: "Have you intensified your vehicle maintenance program specifically to reduce fuel consumption and costs?"

Prudent vehicle fleet operators have had sophisticated, three-stage maintenance programs - preventive maintenance, running maintenance, major overhaul - in place for many years. Many large companies have subscribed to computerized vehicle monitoring systems incorporating "flag" programs which automatically register when the vehicle is due for servicing, due for scheduled parts replacement or

repair (eg. wheel bearings, filters, in-frame engine overhaul) and which pinpoint operating fault problems such as abnormal fuel consumption, tire wear, etc. Driver performance is also monitored by systems which measure fuel consumption, gearing proficiency, and other factors; some companies subscribe to the Ruhl Machinery Ltd. tachograph analysis program.

In answer to the question, therefore, companies which already practice state-of-art technology in maintenance have had little fuel cost savings justification for additional intensification. Companies weak in maintenance may have only recently improved systems to achieve better fuel (and other operating cost) economy. This is reflected in the point grading system with some of the highest maintenance achievers with correspondingly high records of fuel savings achievements receiving lower marks than vehicle users which have more recently intensified maintenance programs to complement other fuel savings programs.

Question: "Do you believe that additional fuel savings can be achieved and would they be significant?"

This question contains some ambiguity, depending upon the respondent. The heavy truck (diesel) operator who indicates that significant savings could be achieved bases his opinion entirely on his perception of what he thinks is possible within the existing parameters of improved diesel engine technology, improved driver skills and better mandates for controlling vehicle speed, engine idling, etc. Many small vehicle operators, on the other hand, considered only two fuel savings opportunities; more energy efficient vehicles from manufacturers or conversion to lower cost alternate fuels (the driver factor was largely ignored). In terms of the total savings significance factor, however, responses between user groups were quite similar; the rationale behind the significance was not addressed in the point grading system.

POOR

QUALITY

ORIGINAL